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AUTHOR Borkowski, Ellen Yu; Henry, David; Larsen, Lida L.; Mateik, Deborah

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ABSTRACT

This paper describes a four-tiered approach to supporting University of Maryland faculty in the development of instructional materials to be delivered via the World Wide Web. The approach leverages existing equipment and staff by the design of Web posting, editing, and management tools for use on the campus-wide information server, "inforM" (a central Web site), and training the trainer instructional modules. Key faculty and staff are identified, and assessment of skills and needs is conducted. Individualized support packages are designed using part, or all, of the four-tiered approach: (1) data entry, scanning, converting and formatting of documents; (2) short course training in the use of the Web and HTML, forms-driven posting and editing tools, and electronic publication and evaluation skills; (3) faculty-focused training and mentoring in instructional technology and pedagogy; and (4) integrated use of cutting edge teaching theaters with continuous instructional technology support staff. (Author/DLS)

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Supporting Teaching and Learning Via the Web: Transforming Hard-Copy Linear Mindsets into Web-Flexible Creative Thinking

Ellen Yu Borkowski
David Henry
Lida L. Larsen
Deborah Mateik

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Supporting Teaching and Learning Via the Web: Transforming Hard-Copy Linear Mindsets into Web-Flexible Creative Thinking

Ellen Yu Borkowski, Teaching Technologies, ellen_borkowski@umail.umd.edu
David Henry, Academic Software Integration and Development, david_henry@umail.umd.edu
Lida L. Larsen, inforM/On-line Information Resources, lida_larsen@umail.umd.edu
Deborah Mateik, Electronic Information Services, deborah_mateik@umail.umd.edu
Academic Information Technology Services, University of Maryland,
College Park, Maryland, USA

Abstract: This paper describes a four-tiered approach to supporting University of Maryland faculty in the development of instructional materials to be delivered via the World Wide Web. It has been implemented leveraging existing equipment and staff by the design of Web posting, editing, and management tools for use on the campus-wide information server, inforM, and training the trainer instructional modules. Key faculty and staff are identified and assessment of skills and needs are conducted. Individualized support packages are designed using part, or all, of the four tiers: data entry, scanning, converting and formatting of documents, short course training in the use of the Web and, specifically, of HTML, forms-driven posting and editing tools, and electronic publication and evaluation skills; faculty-focused training and mentoring in instructional technology and pedagogy; and integrated use of cutting edge teaching theaters with continuous instructional technology staff support.

Background

The University of Maryland at College Park is a Land Grant University that serves 35,000 students and 11,000 faculty and staff. It is composed of 13 Colleges and Schools and 120 academic departments. Information technology requirements and capabilities vary widely. Some faculty have access to the cutting edge resources of electronic classrooms, others have only passing acquaintance with student-oriented open workstation labs and e-mail. The World Wide Web is fast becoming a technological equalizer between these two extremes. Web-based education is possible on this campus thanks to a pervasive network infrastructure (every classroom and office on campus is wired) and a well-developed central Website: inforM (http://www.inform.umd.edu). Faculty and staff may create a Website for themselves, their courses, their research field, or their departments on the system. Academic Information Technology Services (aITs) and its inforM staff--which consists of one content coordinator and 1.4 systems administrators, plus a group of talented student staffers--provide coordination and training for information owners. Our ability to provide valuable and timely information via the Web is directly related to our ability to identify committed information owners, and to provide them with good tools to use and training and support for those tools.

Identifying potential information owners is relatively easy. Engaging some of them is easy--they are already knocking on our door. Engaging others often is not. Even if they understand the importance of their contribution and want to be "on the team," they often believe they lack the time to create and maintain information in a web-format. We have identified the key problem elements as insufficient knowledge, time, experience, and/or desire to transform this information for Web use. A set of Web tools has been developed in response to all of these elements except the necessary desire to be "on the Web". This is not our concern.

It will be noted that human resources are a critical element in both the training of our faculty and in the faculty themselves. When new technologies emerge they must be used appropriately to supplement or

supplant current instructional technologies. We do not enjoy adequate staffing to provide multiple formats of instructional materials. Choices must be made when determining the best format to be used in any setting. Faculty must ask themselves if their Web pages will be the primary source of course materials from which other formats are produced or vice-versa.

Identifying and Meeting Needs of Information Owners with Differing Skills

As with any large institution, our potential information owners have a wide range of computer and Internet skills. Our information owner tools:

- Web Spinner (posting/editing forms driven tool located),
- Calendar Submit (submittal tool for on-line calendar),
- Syllabus Submit (a forms driven tool for posting course information),
- Expire (allows information owners to preset expiration dates for files),

and others have been designed to the low-end of the technical skill range in order to make them the most useful to the largest percentage of the campus population. Like most tools, e.g., a sewing machine or hammer and chisel, they each can be used to create something basic or something complex: a sleeveless vest or an evening gown. The key to the finished product is often in the training of, and expertise in the use of, the tool, and, of course, in the raw materials available for use. We have chosen a four-tier training and support approach to create that base of expertise for faculty information owners on our campus.

Tier One: We Do It All For You

Tier One information owners tend to be those who understand the importance of including their course information on the Webserver, but who lack the expertise, time or interest to process the materials themselves. For these users, we provide a student assistant to process both electronic and hard-copy documents and post them to the system in text format. A scanner is provided for hand-written class notes and graphic materials. Though graphics and HTML support is available, it is not standard at the Tier One level. In certain politically expedient cases, text files are converted to HTML and enhanced with graphics to illustrate to the Tier One information owner the benefits to becoming a Tier Two information owner. It is done frequently when assisting a department to establish a Web presence. A student staff member will work with the departmental liaison to create the initial Web pages while simultaneously training that person in the use of our information owner tools so that they can manage and expand the pages without further assistance in the future.

Moving Tier One Information Owners to Tier Two

The information owners at the Tier One level are strongly encouraged to move to the Tier Two level by taking standard training offered by alTs to learn more about the Internet, inforM and our web management tools. Often, specialized Web in-service training is arranged for an entire department. These sessions focus on potential uses of the Web for their users (e.g., students and colleagues). For example, a session for the faculty of Women's Studies would demonstrate the use of the Web to search inforM's internationally renowned Women's Studies database for research and curriculum development purposes. It would also show the ease with which faculty could make additional contributions to that database to add their expertise to the evolving knowledge base. The session would also demonstrate innovative Web pages created by other faculty members for course materials and specific instructional units, including those utilizing cgi-bin programming, forms support, and other Web technologies.

This effort includes frequent marketing of available Web tools, techniques, and services in regular and guest columns for specialized university publications; active recruitment of specific departmental and research center liaisons; and, high visibility of inforM staff in campus-wide projects and programs. Tier One information owners often feel compelled to move to Tier Two when they understand the full potential of the Web to support them in their teaching and research endeavors. The ability to manage their own Web pages is also a key factor in their decisions to move to the Tier Two level.

Tier Two: Swinging on the Web with a Safety Net

Tier Two provides on-line tools and tutorials with both centralized and decentralized consulting support. All of our basic tools are available on-line. They are password protected if they are input programs such as Web Spinner and Calendar Submit. Student assistants in our office and faculty/staff liaisons in most colleges and some departments have been trained in the use of these tools and can provide help by telephone or in person. Passwords are given to authorized information owners who agree to abide by inforM Guidelines. They are asked to review our on-line tutorials and guides. They are given the name and contact information for our staff and for the contact person in their college or department.

The Standard Scenario

A standard scenario begins when an information owner agrees to manage a specific directory of information on the system, be it a directory of files supportive of a specific course or a database of discipline-specific resources. Authorization is verified with the individual's college or department. Then training needs assessment begins when the inforM Coordinator meets with and assesses the information owner's access to appropriate technical infrastructure and her/his organizational and technical skill levels. The inforM Coordinator then decides with her/him the general formats and input tools that will be used. The Web Spinner tool is demonstrated and the tutorials and guidelines (http://www.inform.umd.edu/CompRes/WWWRes) are pointed out. Training needs are identified and group training opportunities are recommended accordingly. Quite frequently self-selecting faculty operate at a higher technological level and are more "net"-experienced than most. They do well with a minimal amount of training and freedom to independently experiment with the tools provided.

For those faculty requiring a bit more support and training, aITs staff provide regularly scheduled "short courses" on such topics as HTML, Web browsing, and related Internet technologies throughout each semester during working hours. Additional training is available in similar courses taught by University students during non-working hours. These classes are a big draw for students of faculty who have made the commitment to delivering class materials via network technologies, like the Web.

The Web Spinner tool allows information owners to post text or other files in a gopher type tree structure or to create a standard Website of one or more HTML pages. Information owners can freely choose either method. When using the gopher type tree structure, Web Spinner provides "on-the-fly" conversion of the information into an HTML default format. When creating a standard Website, the information owner hard codes or uses the HTML editor of his/her choice and posts the homepage as "index.html".

New information owners are encouraged to build their files on their local hard drive using a package with which they are already comfortable and then to post them using the Web Spinner tool. This can be done by "copying" the file and then "pasting" it into place. Web Spinner can then be used to access files for on-line editing. Web Spinner options include:

- traversing directories and
- moving files and directories
- entering current files to edit
- adding URLs
- making directories
- changing passwords
- posting files
- getting help
- deleting files and directories

Some standard cgi-bin programs and Java scripts have been created for the use of individual information owners. They can do a "copy/paste" of the script, inserting their own text and/or graphics, and including the script within their HTML page.

To support the instructional use of the Web technology beyond the inforM server we offer access to a second Webserver with fewer security controls. This is in response to faculty who wish to do their own

cgi-bin or other programming, or want to provide "webspace" for students to work with cgi-bin or other programming, and/or to post student class projects. We have created a virtual "Office of Technology Assisted Learning" (OTAL) which is comprised of lead staff from inforM and Teaching Technologies, another key unit in aITs. Faculty may submit their own proposals or "sponsor" student proposals for use of the OTAL Webserver. Most projects have a one semester duration. No technical consulting support is provided.

Forms-Driven Templates

Two new forms-driven templates, one for course information and one for faculty/staff information, are being developed at this time that will bridge Tier One and Tier Two. These on-line forms will allow faculty or their support staff to place basic information on inforM for themselves and/or their courses without requiring any involvement of the inforM staff. The forms will be verified using campus IDs and associated PIN information and, for the course information, the semester's current database of course instructors and teaching assistants. The information will be posted in a standardized format and will be linked to from the on-line Schedule of Classes.

Tiers One and Two serve the majority of the information owners on the College Park campus. No UNIX or advanced skills are necessary to create a Website. Basic information is provided to our users. General guidelines for format and content are followed. A small fraction of these information owners have spent the time necessary to develop advanced HTML skills and have creatively used our disk space to implement highly effective Websites. In cooperation with these individuals, the campus' Center for Teaching Excellence and the Teaching Technologies office, Tiers Three and Four have been developed.

Tier Three: Training Web Innovators--Institute for Instructional Technology

Faculty are the primary engineers of curricular development on the University of Maryland at College Park campus. However, many faculty are daunted and confused by the vast array of computer, information, and communication technologies at their disposal. For effective use of campus technology, faculty need support in terms of training, resources, and feedback.

Faculty-Focused Training and Mentoring

Tier Three targets faculty and their technical support staff who have an interest in developing advanced HTML and instructional technology skills to create course materials on-line. In response to faculty support requirements, the Institute for Instructional Technology (IIT) was developed as a collaborative effort between aITs and the Center for Teaching Excellence, a unit that promotes faculty innovation and peer mentoring to improve the quality of student learning on campus. Institute agenda (http://www.inform.umd.edu/TeachTech/IIT/) are comprised of theoretical and practical information taught by pedagogical experts, academic information technology staff, and faculty mentors. Modules include:

- Pedagogical Frameworks
- Graphic Design
- Instructional Use of Listservs/Mail Reflectors
- Legal Issues
- Electronic Publication
- Web Spinner
- Website Evaluation Techniques
- HTML

Each Institute takes up to 20 participants with little or no experience and trains them to be key users and innovators of the Web technology. To participate in IIT seminars and workshops, interested faculty submit proposals outlining their goals for transforming an existing curriculum through technology; their acceptance into the program is based upon the appropriateness of their proposals to the actual objectives of the workshops and upon the space available.

While the IIT provides concentrations in such areas as electronic communication, graphic design and multimedia courseware development, and World Wide Web-based instructional delivery systems, by far the most popular has been the Web module. In fact, some of the most innovative products developed by IIT "graduates" have been Web pages supportive of course curriculum.

On the first day, participants were taught the basics of HTML programming, explored some examples of web-based syllabi and other classroom support materials, and were mentored through a two-hour workshop period (where the ratio of lab assistants to participants was approximately one to three). It is interesting to note that, while most faculty plunged through the challenge of learning simple HTML coding, it was the collective opinion of the class that in the long-term it is more important for faculty to understand the possibilities and limitations of Web page development, and to find a technical support person or talented student to perform the coding tasks. Most faculty see themselves as instructional designers, not technicians.

The focus shifted from text to graphics on day two with a brief introduction to scanning and Adobe Photoshop. Participants were given guidelines for techniques for effective electronic publishing (e.g., usable image sizes and placement options, screen composition, etc.). Another afternoon was spent in workshop format continuing the construction of faculty pages. The high ratio of helpers to participants was useful on this day in particular because, surprisingly, most faculty had little or no experience with file transfer protocols and required close handholding when it came time to transfer their graphics from the desktop to their pages. On the final day, Web Spinner instruction, fine tuning Web pages and managing their own file structures on the Web were covered. Participants also had a peer mentoring session with a faculty member who has successfully integrated the Web technology into the conduct of her classes. The mentor provided no hands-on training, but rather gave IIT faculty a pedagogical overview of the process. The mentor candidly shared insights into how the infusion of this new technology into her curriculum has altered the way she teaches those classes and how it has changed the ways her students learn in class.

What a Commitment to Web Technology in the Classroom Means to Faculty and Students

Discussion arising from the mentored session in this first IIT explored such issues as,

- "is the Web the great panacea for all courses?" (e.g., nothing is gained by introducing technology simply for technology's sake);
- "do most students have the basic technological background to make use of the Web?," and "is there sufficient access to the technology on campus for all students?";
- "is there a recognized 'pay off' for faculty who publish on the Web?" (therefore making it more worthy of their time and consideration); and
- "is there a way to evaluate the impact that technology, and specifically the Web, has on student learning and retention of information?"

Not all of these questions were definitively answered during the peer mentored session. Most participants, who represented disciplines as diverse as Landscape Architecture, Geography, Education, Journalism, and Engineering, believed the Web offers an information delivery medium appropriate to the focus of their coursework. In fact, the proposals they submitted in order to enroll in the IIT were reviewed specifically to ensure that Web technology is, indeed, an appropriate delivery device for the content of their curriculum.

The recognition of the World Wide Web as a valid publication medium for tenure-track faculty is a battle being fought on most campuses around the world. At the University of Maryland, faculty are encouraged to mention electronic publications, Web-based curriculum development, and participation in such enterprises as the Institute for Instructional Technology on their vitae. However, at this time, electronic publication is not weighted equally with more traditional publication genres.

The evaluation of the effectiveness of the integration of this technology into the curriculum will come about as more faculty make use of it and report their experiences to their peers and administration. One of the faculty mentors for an IIT module was able to informally evaluate her Web experience by offering

two sections of the course: one taught through traditional lecture and report means, and the other taught by integrating the World Wide Web into all facets of the coursework. In the traditional class, all reading materials were distributed or pointed to in libraries; students wrote reports with word processors and gave in-class reviews of their research. Collaboration on projects was sometimes hindered by incompatible schedules and the like. Students in the Web-based section were directed to readings on-line and to library resources. Most students also used the Web to search out additional reading materials beyond the assigned information (because it was so easy to do). All student research and reports were put together and delivered on the Web. Students were able to collaborate at least partially electronically and continued to make changes to improve the pages even after a grade had been assigned to a project. For both classes, the average grade was a B (project grades were higher in the Web- based class). The faculty mentor indicated that the most telling evaluative feedback came from the students themselves. While students in the Web-based class felt there was more time invested in projects and a steeper learning curve at the start of the class, their sense of accomplishment was greater, the collaborative process was more fruitful, and their confidence in their abilities to do to more integrated, independent research was sharply increased.

What We Learned About Coaching Web Spinning Faculty

Faculty feedback from the first Institute for Instructional Technology module served to refine the direction of faculty Web page support in two areas: the structure and content of future Web Page Development training events and adjunct Web page support services for faculty.

When IIT sponsored its next Web Page Development module several changes were made to the curriculum. A fourth day was added to provide training time in the use of FTP, to provide additional training in a few advanced HTML concepts (e.g., backgrounds, tables), to expand the mentored hands-on workshop periods, and to make time for peer critiquing of the pages under development. A fifth day was added in which standards for citing electronic resources were offered and Website evaluation techniques were covered. In the Website evaluation techniques session, participants were taught to look for the elements of scope, authority, bias, accuracy, timeliness, permanence, added value, and presentation. This enables them to more objectively review their own Web pages for these elements.

Tier Four: Teaching Technologies

Tier Four targets a specific population of faculty who are teaching in the campus' electronic classrooms or who have requested instructional technology assistance for their classes. The electronic classrooms, called Teaching Theaters (http://www.inform.umd.edu/TT/), are advanced electronic classrooms with well-integrated hardware, software, and networking. Software tools have been developed to enhance the collaborative learning environment available in these classrooms. With the introduction of the Web, additional capabilities now exist for faculty using these facilities to support collaboration both in and out of class. The Teaching Technologies office (http://www.inform.umd.edu/TeachTech/), which manages these facilities, works individually with the faculty member to develop his/her course materials and student projects utilizing the campus' inforM server and a Teaching Technologies webserver. The Teaching Technologies Webserver provides interactive Web capabilities (including cgi scripting) and supports individual student projects. Student projects are created individually and/or collaboratively depending on the particular course.

Web pages are provided for all the courses that are held in the Teaching Theaters that link to the course description and syllabus plus the instructor's home page, if available. Another feature added to the pages this current semester is WebChat(tm) discussion pages. WebChat(tm) is a real-time fully multimedia chatting application for the Web. Users can quickly incorporate images, video and audio clips, and "hotlinks" into their chat. This tool has supported discussions of topics both within and outside of class. It has also allowed the support of a collaborative project between an Art History course being taught in the Teaching Theater and an Art Studio course being taught in a traditional classroom. Art History students were required to write a textual analysis of an image which was then given to their Art Studio team members. The Art Studio students then had to create the image from the textual analysis without having seen the original image. Discussion about the process and final results were conducted over the Web using WebChat(tm).

Most of the faculty using the Web support provided by Teaching Technologies have gone through the intensive week(s) of the Institute for Instructional Technology mentioned above. Support for developing materials is provided prior to the semester they are going to utilize the materials. Each faculty member has the opportunity to use both instructional experts and computing experts to develop courses taught with integral use of the Web and other instructional technology on a daily basis.

A vital part of Teaching Technologies is its support team. The team includes both technical and pedagogical experts. At least one support person is present during every use of every electronic classroom. Instructional support is provided to the faculty member prior to and during each semester to assist in preparation through group and individual training. Additional group sessions are organized for the exchange of ideas and experiences. These classrooms offer unique research opportunities in such areas as the study of classroom behavior, teaching strategies, comparative methodologies, and effectiveness of technology.

Conclusion

We feel that our current four-tier approach to meeting the support and training needs of our faculty information owners is appropriate for the variety of technical capabilities and inquisitiveness demonstrated by that group. As our base of faculty Web Spinners grows in the coming year, we will continue to develop more tools and training venues that will facilitate the development of course materials and integrated, discipline-specific databases, while leveraging modest staff resources that are not scheduled to grow in that same timeframe. If these tools and training truly do their jobs, then faculty can, indeed, be the primary architects of academic Web content. They can concentrate on transforming traditional linear forms of delivering information to their students and colleagues into creative and collaborative associations of information via the Web without becoming mired in code and procedures. The fifth and final tier of user support: self-support and full ownership of information that advances contributions to the curriculum and discipline on the part of College Park faculty.